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taining the statement of the preface that "it is the custom of our colleges to make psychology the path by which to enter the fields of philosophy."

Elements of Physiological Psychology. A Treatise of the Activities and Nature of the Mind, from the Physical and Experimental Point of View. By George T. Ladd, Professor of Philosophy in Yale University. New York, 1887. pp. 696.

Thanks to Professor Ladd's book—it is at last possible to read a plain statement of the facts of a good part of the field of experimental psychology in English. Its merit in this fundamental respect is incomparably greater than any one book in our language, and it is likely to be for a long time indispensable to every student of the subject not familiar with German. Roughly speaking, over five of his nine hundred pages are devoted to a condensed and generally clearly arranged account of results of special scientific investigations, less concisely stated than in Hermann, but more lucid than in Wundt. The facts are often gathered with great industry from many special monographs more recent than the chief German text books, and along some lines brought down to date without substantial omissions. The author is not intent on illustrating any theory or system belonging to an utterly different attitude, period and method, or stage of development, but the system consists in a plain grouping of the facts which are allowed to speak out for themselves. Taken all in all, the book cannot fail to have a most wholesome and stimulating effect on the study of mental phenomenon in the institutions of higher education in this country. It should be read by students of medicine and theology, as well as of philosophy, and teachers who desire to know the scientific basis of modern methods of pedagogy will derive great benefit from its pages. The vast fields of morbid and also of anthropological psychology, psycho-genesis and instinct, which might be included in the title, are excluded, and even within the limits imposed on himself by the author, there are many deficiencies, but from the fact of so large a book, covering only a part of its field, the reader will readily infer the immense accumulation of material which already crowds the psycho-physic domain, and superficial or disparaging text-books in this field will henceforth be impossible, or at least ignored. All this applies to the first two parts, or to the first two-thirds of the book only. The first part is devoted to the nervous mechanism. The nervous elements are first considered chemically and histologically and physiologically, and then their combination into a system involving a sketch of the general anatomy of the cerebro-spinal system. Nerves as conductors, automatic and reflex functions and organs, the development of the nervous system and the mechanical theory of its action, are each given a chapter. Part second is on the correlations of the nervous mechanism and the mind. Two long chapters are given to localization, and two to the quality of sensations, one to their quantity; then come two chapters vaguely entitled the presentations of sense, devoted to the perception, as it is more commonly termed of space, form, motion, etc.; then come physiological time, feelings, and a final and isolated anthropological chapter on certain statistical relations of the body and mental phenomena. These chapters are illustrated by one hundred and fourteen wood cuts, about ninety of

which are anatomical, mostly gross, and copious references to special literature are given the form of foot notes, and there are many tables.

In the present condition of foreign literature, it is far easier than it would have been a few years ago, to compile a book like this; but it must still have required not only much industry, but considerable time. For one not practically familiar with laboratory methods in physiological chemistry, histology, physiology and psychology, to have done this work on the whole so creditably, even from the standpoint of specialists in these fields, suggests the possibility or a division of labor between writers of general treatises and those engaged in experimental research, which may perhaps be helpful to both, and to the cause of science. With so large a book, so filled with facts it is impossible to deal in detail. We shall content ourselves in pointing out a few of the significant defects of the book, which it is hoped may be remedied in another well-revised edition. To dissect out the axis cylinder of nerves to be chemically analyzed by itself is said to be "by no means always easy." All such preliminary anatomy is of course at present as absolutely impossible, as it is indispensable for specific results of pertinence. That this cannot be done renders much of the general chemical information presented scarcely more relative to psychology than to general biology. A compilation of the inferences now indirectly suggested in the field of micro-chemistry, by the action of different staining fluids, would have been better. Again we are told that "one of the processes of each cell may, as a rule, be regarded as continuous with the axis cylinder of a nerve fibre." This general view, which also conditions much else, is rendered improbable, if not false, by the work of both Golgi and of Forel, the total ignoring of which, as well as of so much valuable Italian work generally, is a grave defect. The treatment of cells is inadequate and apparently uninformed, and yet cytological conceptions now seem likely to be those upon which the whole mechanical theory may be reconstructed and transformed. The account of Wundt's theory of the mechanism of nerves seems derived entirely from the chapter in his psychology, which is called "more complete" than his larger work on the subject, but which is very meagre, almost to the verge of unintelligibility, as are the accounts of the theories of DuBois-Reymond and Hermann, and none of the later phases of the question are presented. The chapter on the mechanical theory is probably the most inadequate in the book. On the basis of what is given in this vast topic everyone would agree with the author's conclusion, that a "confession of ignorance might fitly close the entire discussion." In the chapter on reflexes Eckhardt's larger work, which might have been followed, if not as literally as Foster and Balfour confessedly are in the embryological chapter, at least no less implicitly than Hermann's Handbuch is in some parts of other chapters, and other well-known works elsewhere, is apparently unknown. Had it been utilized the chapter might have been materially improved, and especially the work of the Ludwig school on this important topic would have been given due place. Those whose interest in physiological psychology is rooted in metaphysics, attach great importance to studies on the localization of cerebral functions, a line of research upon which many physiologists look with suspicion as a field with which the methods of experimentation in vogue, in the

backward state of psychological analysis, are not yet able to cope in a way to give assured results. The latter are few and briefly stated, the controversies voluminous. Instead of the two long chapters devoted to this topic the utility of a book of this size would be increased by a briefer statement of the results of experiment, with reproductions of the charts of Exner and of Flechsig, which, strangely enough, with all mention of the extremely significant and perhaps epoch-making work of Steiner, are omitted. These three landmarks in this field should by all means be given a place in another edition; but all this material should be more briefly and concisely stated, and more space given to the great topic of aphasia. In such a book Jäger's theory is surely worthy a passing mention. The chapter on the quantity of sensation is hardly less inadequate than that on the mechanical theory, and needs much reconstruction. Not only are extremely significant views entirely omitted, like that originated by Mr. C. S. Pierce, but Fechner's general conception of the subject, and Delboeuf's method and its motivation are substantially wanting, and there seems to be here, as occasionally through the book, padding with matter, the bearings of which are not fully seen, or at least not stated. The two chapters on perception will prove very convenient in the class-room. In this vast field, also, the work of a compiler must be hard, and great range for individual preference should be allowed. The work of Le Conte Stevens certainly merits mention, and the author has given too little attention to the views of Hering. There is ample field here for more cuts, even if at the expense of some of the common brain chart. The time chapter, though much less useful for students than the later conspectus of Professor James, is valuable. The work done here is limited, and admits of easy statement. Time sense and reaction-time, however, have so little to do with each other that it would have been better to separate the two and to have given the former topic a fuller treatment. The last three chapters of part second are less concise and more speculative, but still very convenient to the student for the facts they contain. As a whole, the work bears somewhat the same relation to the field it covers as President Porter's *Human Intellect* does to psychology from its standpoint. Professor Ladd's work, however, is incomparably harder and is far better done. That everything pertaining to "insanity, delirium, aphasia, somnambulism, ecstasy, mind-reading, spiritualism, and even sleep and dreaming," are "definitely excluded," because these are not normal states, illustrates the extreme superficiality of the demarcation of the field. This has, however, the great convenience, that in these excluded fields lie just the problems which at present seem most inconsistent with the author's appended theory of the reality of a thinking ego, and the final and absolute nature of self-consciousness in the sense held to by him. Over and over again we are reminded of the utter disparity between brain action and concomitant consciousness. Yet diagrams of even the gross anatomy of the nervous centres profusely given, seem to him more relevant than are the above manifestations of the unconscious to the standpoint of the "forever undefinable consciousness." Moreover, just appreciation of the facts in this excluded field is precisely what tends to break down the middle wall of partition between nervous and mental changes, every chink in which metaphysicians are so intent on stopping, and gives a sense of a correlation between them which is something more and nearer

than telepathic. The general disregard of methods of research, the description of which affords a natural, logical approach to experimental results, aids again in isolating neuro and psycho-physical facts.

The experience of a man who has once had the invaluable training of abandoning himself to long experimental research on some very special problem—whether with a nerve-muscle preparation of a frog, the structure of a ganglion cell, physiological time or any topic wisely chosen, and whether working under the guidance of a great teacher or of his own instinct, is often somewhat as follows. At first there is a sense of limitation, a fear of loss in focusing all energy upon so small and seemingly insignificant a subject. It seems not liberal, still less broad philosophic culture. Especially by those used to the unrestrained freedom and slightly enervated by the sense of "vastation" which makes metaphysical speculation so intoxicating, it is often abandoned as less attractive than the free treatment of results of others' work. If the work is pushed on, however, the student finds that he must know in a more minute and practical way than before—a way that comes to make previous knowledge in the field seem unreal—certain definite points in electricity, chemistry, mechanics, etc., and these are brought into fruitful suggestive unitary relations with each other. The history of previous views pertaining to the topic are studied and understood as never before, and broader biological relations are gradually seen. As the work goes on for months and perhaps years it gathers momentum until gradually many of the mysteries of the universe seem to him to centre in his problem. In the presence of one minute fact of nature he has passed from the attitude of Peter Bell, of whom the poet says, "a cowslip by the river's brim, a yellow cowslip, was to him, and it was nothing more," to the standpoint of the seer who plucked a flower from the crannied wall and realized that could he but understand what it was root and all, and all in all, he would "know what God and man is." Even though he may not have contributed a tiny brick to the great temple of science in the shape of discovery, he has felt the *omne tutum punctum* of nature's organic unity in a sense far deeper than speculation knows, and has realized what higher education in the modern, as distinct from the mediaeval sense, is. In a word, nearly all the defects in the book before us spring from the circumstance that the facts of physiological psychology, which we are told in the Introduction cannot be called "even a definite branch of the science of psychology in general," are viewed with the eyes of Peter Bell, which seeing, see not. This appears in the frequent dependence on current hand-books, in the perspective with which certain groups of facts are presented, the purely external classification, in a few novel translations of technical terms, as *e. g.*, *Nervenstrecke*, *Zwangsbewegungen*, *Erregungsherde*, etc.

The third part need not detain us. Its merit, standpoint and style are so different that those interested in the first two parts will care little for the third, and *vice versa*. The author's creed respecting the powers and unity and development of the mind and its relations to the brain lead up to the culminating thesis of "The Mind as a Real Being," the failure of experimental studies up to date to demonstrate which occasions their repeated designation of "psychology without a soul." In the preface we are told that "one result of all our subsequent investigations will be to show us that consciousness

and its primary phenomena can never be defined." Histology gives much information, but it is "mingled with a still larger amount of conjecture and doubt." Why brain changes and conscious experience are related "will always remain an unsolvable inquiry." We are "indefinitely far" from "even a reasonable prospect" of a physical science of the nervous system. Science is "not yet able to deal with the phenomena of nervous action, as shown even by a single living nerve with a muscle attached, when acted on by any one form of external stimuli; how much less," etc. It is all "a leap in the dark;" "difficulties are absolutely insurmountable;" were brain-changes known they could not be conceived as a "true cause" of anything psychic. The mind is "a real unit being," "of non-material nature, and acts and develops according to laws of its own" and its "origin and destiny, its mortality and corruptibility, physiological psychology finds itself unable to demonstrate, though it may suggest, and perhaps confirm," the author's theories in this field. It may, however, clear away "barriers of ignorance and prejudice," and open up a broader way "to rational psychology, to ethics, to metaphysics and to theology." We shall not quarrel with all this. It can be said in any field of science that there is a something quintessential not yet explored. Science is not ontology, but phenomenology, and there is nothing in physiological psychology to disprove the author's creed nor our own. As to the whole "two clock theory," it is as true in the entire psycho-physic field as Hughlings Jackson well says it is in morbid psychology, that even to understand the brain we must not take too materialistic a view of the mind. The concomitance theory is far better, even as a working hypothesis, than the theory of identity. To say, he asserts, that ideas produce movement, the mind influence the body, etc., implies disbelief in the doctrine of the conservation of energy, and the use of all such terms as ideo-motor, physiology of mind and even psycho-physics is a logical cross division. If an histologist can use any or even all conscious activities as means to study brain structure, or if structure be studied as a means to a knowledge of function, the argument of correlation vs. ideality is as irrelevant in kind, at least, as it would be in the field of any other comparative study. That the author utilizes his "sense of chasm" by restating so well on the whole, though with such needless prolixity, these inveterate and to our thinking, mild and commonplace Lotzeanisms apart by themselves, instead of having them "read into" the experimental details like Dr. Dewey, erects to our mind another prejudice in favor of his dualistic attitude.

In the whole field of biology, including psychology, it is as often necessary (and probably increasingly more so) to proceed from the complex, whether the organic unity of the cell, the physical individual or his consciousness, to the simple, as from the simple to the complex. That any one who has carefully studied the modern concepts of physics concerning matter and force, however firmly grounded in the mechanical theory, will fail to feel that, as Mach has so fully pointed out, physics may be very soon led to a very different, psycho-sensory definition and conception of matter and force, seems to us unlikely. Striking and grateful as such a conversion would be to those whose whole psychology centres in the theory of knowledge, it would only modify the form of a single symbol, or be a light of different hue shed upon a familiar sense.

It would only aid us to see that conceptions of mind and of matter, of self-consciousness and motion, cannot possibly be disparate and incommensurable, because both are concepts, and equally ideal—that least immediately known, in fact, the most ideal. For theological minds it is consciously or unconsciously the question of immortality that animates all this kind of argument. From this standpoint nothing could be more unwise than to give sensations and in a sense even feelings over to neurophysics as hardly less foreign to the soul as a real being, whose chief function is to unfold *knowledge* by relating these, than body. If this is all the spiritual unity, reality, etc., that remains, and if even its traits cannot be deduced in any *a priori* way, but must be laboriously sought from an inductive study of particulars, then both the ends striven for in the old anti-materialistic crusade have become even more barren than we thought. Feeling, sensation, the unconscious elements in which most psychic secrets are wrapped up, as well as all matter, force and mind, transcendental and real objects, creed and fact, as well as knowledge and the ego that knows,—not one or a few, but all of these, must, of course, forever be parts or aspects of that complex concept we designate as the world, and hence ideal. For every scientific object, or for every end of knowledge *per se*, if that is the highest, it does not make one hair white or black, whether we work by this hypothesis or by that of realism. The problem between the two, though one of the most seductive of all modern puzzles, is probably the most barren and incapable of solution. The main thing is that we really work on whatever theory. Let those who prefer absorption in self-consciousness really interpret the conscious ego, and be no longer to vaunt the ancient triumph, or repeat the old stages of the method. Experiment is now checked at many points till the work of subjective analysis be done over again, and better and finer. Let those that prefer literary work now take the next step and prepare manuals as full and large as Professor Ladd's on each of the special great chapters in psychology, *e. g.*, psycho-genesis, space-perception, psycho-physic law, physiological time, physiological optics, and acoustics expression, etc., on some of which themes we are glad to know comprehensive special treatises are now well under way. Experiment has already opened, and is just beginning to work one of the richest of all of scientific mines, and every writer and every explorer of subjective consciousness must now know something practically of its methods. Coöperation here already promises, not only important acquisition to the knowledge of man, but the better academic standing of the philosophic departments in our higher institutions of learning. If there is anything on which men may now differ in opinion, and yet abate not one iota of sympathy and mutual appreciation, it is on these points.

All these suggestions aside, however, we desire to recognize, in the most candid way, the great debt of gratitude which all students and teachers in this field owe to Professor Ladd. His work is sure to give a great impulse to those studies which have been sadly hindered by the want of what he here supplies. Even for the book as a whole, we have five parts of hearty commendation for every one of criticism and dissent.